



Nitrogen Oxides. How Are They Affecting Our Environment?

5th Class

St. Clare's Primary School, Harold's Cross, Dublin 6W



Introduction

Our school is located in Harold's Cross in Dublin city centre. Currently, there are close to 300 students attending our school. Our school is very environmentally aware and has been for the past 19 years, when we first began our Green School initiatives. We now have 12 Green Flags, the most recent one being Global Citizenship: Marine Environment. We are currently working towards our 13th Green Flag: Global Citizenship: Travel and so the GLOBE initiative this year fitted perfectly with our Green School target! As a school, we make a huge effort to walk, cycle or scoot to school instead of using cars. Some of our initiatives to combat the burning of fossil fuels include; Walk On Wednesday (WOW day), Cycle On Wednesday (COW day) and Scoot On Wednesday (SOW day). We examine the graphs every week in assembly to see which class is making the most effort! We have even been given a grant to build a new scooter and bike shed because of these initiatives!

Research Methods

Our predictions for our NO₂ collection test tubes were as follows;

- The school gate will have the highest concentration of NO₂ as it is the location which is most exposed to moving traffic.
- The school garden will have the lowest concentration of NO₂ as it is the location with the least exposure to traffic.



As a class, we conducted three experiments concerning Acid Rain and our environment.

Acid Attack: We placed damp cotton wool and 5 bean seeds on two jam jar lids. Each day, a student from our class sprinkled both lids with water and poured lemon juice on just one of the lids (labelled Acid Rain). This was used to show how Acid Rain affects vegetation. We also took a piece of cement and placed it in a jar of vinegar to show the affect of Acid Rain on buildings.

Acid Rain Indicator: This involved making an Acid Indicator from red cabbage. We placed the same amount of indicator in each jar (200ml). We added baking soda (base/alkaline) to one jar, vinegar (acid) to another and rainwater from our rain gauge to another. This enabled us to gauge whether the rain water in our environment was acidic.

The Water Cycle: We drew the water cycle on a clear food bag and put water in it. We placed the bag on a window sill in the sunshine. This demonstrated how Acid Rain is made and falls to the earth.

Results

NO ₂ concentration (µg/m ³)	Description
50-55	Extremely Bad
45-50	Very Bad
40-45	Bad
35-40	Substandard
30-35	Mediocre
25-30	Average
20-25	Pretty Good
15-20	Good
10-15	Very Good
0-10	Excellent

Our school gate: 26.85 (µg/m³)
Our staff car park: 24.85 (µg/m³)
Our school garden: 20.92 (µg/m³)

Acid Rain Indicator: The indicator in the jar with vinegar (acid) turned pink and the indicator in the jar with baking soda (base/alkaline) turned light purple. The rainwater in our environment was neutral as the colour of the indicator remained blue.



Acid Attack: There was no major changes between the beans labelled Acid Rain and the beans which had no lemon juice placed on them. However, the cement showed signs of decomposition.



The Water Cycle: This demonstrated how acid rain falls to the ground through the water cycle as the water rose to the top of the bag in droplets and dripped down to the bottom again.

Discussion

As you can see from the NO₂ collection test tube results, our school fell into the average and pretty good description boxes. We were delighted to see that our predictions were correct! Although there were no major changes to the beans or the cement in our Acid Attack experiments, we discussed and acknowledged that over longer periods of time, consistent amounts of Acid Rain could be damaging our environment. It was interesting to see the different colours of the Acid Rain Indicator based on the different materials tested. We were happy to see that the rain water in our school environment was not acidic! We discussed ideas on how we could further reduce the amount of cars being used in our school environment. Our Green School Committee came up with the idea of a scooter train which made it's first departure on 27th February 2019. It runs every Wednesday morning from the park in Harold's Cross to our school. We are hoping that this initiative will reduce the amount of cars being driven to school and therefore reduce the amount of nitrogen dioxide entering the atmosphere.



Research Question(s)

This year, we were given special test tubes which measure the amount of Nitrogen Dioxide (NO₂). Nitrogen dioxide is generated when nitrogen from car exhausts mixes with the oxygen in the air. We chose to place these test tubes in three locations around our school. These locations were; the school gate, the staff car park and the school garden. We made predictions about which location we felt would have the most and least amount of NO₂ in the air. After placing our NO₂ collection test tubes in these locations, we began conducting some research into Particulate Matter and NO₂, and their effects on the environment as a whole. From there, we focused primarily on Nitrogen Oxides and their effects on the environment – more specifically Acid Rain.

Conclusions

The more traffic in our environment, the more nitrogen dioxide that is released into the atmosphere. Therefore, the more initiatives we take to reduce the amount of cars being used the better. If we were to complete this project again, we would complete each of the Acid Attack experiments over a longer period of time. We would also test many different materials and compare them to the acid/alkaline jam jars and, if possible, use real PH indicators to accurately measure the PH of each item.

Bibliography

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